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09/623,011	09/28/2000	Arnold Lamm	1748X/49135	5703

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EXAMINER
MERCADO, JULIAN A

ART UNIT	PAPER NUMBER
1745	7

DATE MAILED: 06/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/623,011	Applicant(s) LAMM ET AL.	
	Examiner Julian A. Mercado	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *10-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *10-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *1* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 10, 11, 12, 13, 18, 19 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Van Dine et al. (U.S. Pat. 5,573,866).

Van Dine teaches a fuel cell system having an anode compartment [6], a cathode compartment [8], a proton-conducting membrane [4], a cathode feeder [26] for delivering oxygen-containing gas such as air, an anode feeder [18] for delivering a liquid coolant/fuel mixture such as water and methanol, a pump [20] for pumping the mixture to the anode compartment. (col. 3 line 35 et seq.)

As to cooling of the coolant/fuel mixture, controlling pressure or controlling delivery of the coolant fuel mixture, it is noted that these limitations have not been given patentable weight for claims 10 and 18 as the method limitations fail to give breadth or scope to the apparatus claims. To the extent that these limitations are applicable towards the method claims, Van Dine teaches the following as found in column 3 line 52 et seq.:

> A fan **26** is mounted in a passage **28** and draws ambient air into the cathode chamber **8** so as to cool the latter. The cooling air stream exits from the cathode chamber **8** through a common manifold **30** which serves both the anode and cathode sides of the cell **10**. The cooling air stream evaporates any cross-over water, methanol and product water, thus cooling the cathode side of the cell **10** and preventing flooding of the cathode catalyst layer **9**. The humidified air stream exiting the cathode chamber **8** through the manifold **30** passes into a condenser **32** where the methanol and water content of the cathode effluent air stream is condensed out of the air stream. Cooling air for the condenser **32** is supplied by a fan **34** which selectively directs a stream of ambient cooling air across the condenser **32**. The line **36** ducts water, carbon dioxide, and methanol which may evaporate from the anode chamber **6** into the condenser **32**. Condensed water

As found in this passage, the coolant/fuel mixture of water and methanol is cooled upon passage through the membrane as reactant "cross-over" and into the cathode side of the fuel cell.

As to controlling pressure of the cathode compartment to set the operating temperature of the fuel cell, the fan [26] is deemed to control the pressure insofar as it provides positive pressure to the cathode compartment in "draw[ing] ambient air into the cathode chamber" so as to cool the chamber. (lines 52-53)

As to controlling the delivery of the coolant/fuel mixture from pump [20] to set the operating temperature of the fuel cell, Van Dine teaches the following as found in column 4 line 5 et seq.:

> vented from the condenser **32** through a line **40**. The methanol metering fuel pump **20** can be selectively operated and controlled by a solenoid **42** activated when the electric load is applied. Likewise, the condenser fan **34** can be

and further line 36 et seq.:

> cooling loop. The use of the water-methanol mixture, and the resultant water cross-over, as well as the expression and evaporation of product water on the cathode side allows the stack to be operated at higher temperatures without risking electrolyte dryout.

As found in this passage, the pump can be selectively operated to control the level of coolant/fuel mixture. Thus, control of the pump would naturally flow to determine the rate of cooling at the cathode side of the fuel cell and the resulting operating temperature of the fuel cell.

As to an expander unit, Van Dine teaches an expander unit [32] which is noted to condense water out of the cathode circuit. (col. 3 lines59-63)

Claims 10-22 are rejected under 35 U.S.C. 102(e) as being anticipated by Hornburg et al. (U.S. Pat. 5,981,096).

Honrburg teaches a fuel cell system having an anode compartment [2], a cathode compartment [3] and a proton-conducting membrane [4]. A cathode feeder, i.e. pipe is shown between an intercooler [32] and the cathode which is considered to deliver an oxygen-containing gas such as air. An anode feeder of similar construction and function delivers a liquid coolant/fuel mixture such as water and methanol. (col. 3 line 8 et seq.) The feeder is supplied by a pump [13] for pumping the mixture to the anode compartment.

As to cooling of the coolant/fuel mixture, controlling pressure or controlling delivery of the coolant fuel mixture, these limitations have not been given patentable weight as the method limitations fail to give breadth or scope to the apparatus claims 10 and 18. To the extent that these limitations are applicable towards the method claims 19-23, Hornburg teaches the following as found in column 3 line 23 et seq.:

> A problem which develops on the anode side is that the carbon dioxide enriched with methanol vapor and water vapor must now be separated from the liquid/gas mixture in the return pipe **7**. An excessive methanol discharge by way of the carbon dioxide gas must be prevented, because otherwise the overall efficiency of the system is reduced and simultaneously unburned methanol would be discharged into the environment. For this purpose, a two-step system is provided for the gas separation. A first gas separator **18** for separating gas from the hot liquid/gas mixture is arranged in the return pipe **7**. The hot liquid is then conducted from the return pipe **7** into the anode feed pipe **5** while, by means of a pipe **33**, the vapor is fed by way of a cooler **20** to a second gas separator **21**. The vapor is therefore not separated until the cooling has taken place in the second gas separator **21**. Thus such separation takes place at the coldest point of the system, so that the methanol discharge by way of the carbon dioxide is considerably reduced.

Thus, as disclosed in the foregoing, cooling of the "methanol vapor and water vapor" is effected in the fuel cell by way of at least one separator to separate the respective vapors and return them to the anode. The separator is also deemed to teach the instant at least one water separator for water recovery with a feedback line to recycle water back to the anode. (applies specifically to claim 13 and claim 17)

As to controlling the pressure of the cathode compartment, Hornburg teaches the following as found in column 3 line 64 et seq.:

> Furthermore, additional bypass pipes **27, 28**, which have integrated metering valves **29, 30** and heat exchangers **31, 32**, can be provided. By means of these elements, thermal energy can be transmitted as necessary, from the hot cathode exhaust air in the cathode exhaust pipe **8** to the cooled methanol/water mixture in the pipe **22** or from the hot methanol/water mixture in the anode feed pipe **5** to the cooler air flow in the cathode feed pipe **6**. For this purpose, the heat exchangers **31, 32** are preferably arranged in the cathode exhaust pipe **8** between the cathode space **3** and the expander **12** or in the cathode feed pipe **6** between the compressor **10** and the cathode space **3**. Furthermore, for regulating the metering valve **29**, a temperature sensor **35** can be provided downstream of the heat exchanger **31** in the cathode exhaust pipe **8**. By means of the heat exchanger **32**, the hot charged air is preferably cooled to a temperature of down to 100° C. before entering the cathode space **3**.

Thus, as disclosed in the foregoing, the pressure of the cathode compartment is controlled by metering valve [30] which operates in conjunction with heat exchanger [32], the latter structure specifically disclosed to cool the temperature of the cathode gas.

As to controlling the delivery of the coolant fuel mixture to set the operating temperature of the fuel cell, Hornburg teaches that "the flow rates, and thus the temperature levels, in the … anode" can be influenced. (col. 3 line 59-63) Of note, the patentees teach that "antifreeze measures are not required" due to use of the coolant fuel mixture. (col. 4 line 52-54) The operating temperature of the fuel cell is within the instant range of 90 – 110 °C, specifically at 100 °C. (col. 4 line 13)

As to the expander unit to which water vapor generated in the cathode is delivered and a compressor disposed in the cathode feeder, Hornburg teaches an expander unit [12] to separate water vapor from the cathode exhaust. (col. 4 line 20-23) A compressor [10] is in direct fluid connection with the cathode. (col. 4 line 4 et seq., applies to claim 20 and 22)

As to a holding and purification tank upstream of the gas separator and to the extent that the claims are understood by the examiner for the reasons discussed under 35 U.S.C. 112, second paragraph (discussion above), Hornburg teaches a second gas separator which is disclosed to cool the vapors so as to separate the vapors from the coolant/fuel mixture. (col. 3 line 36 et seq.) Such separation function is deemed to read on the functions of a purification tank. The vapors are considered to be in a holding state by the separator (consequently functioning as a holding tank) since the patentees specifically teach that the vapors are not separated until cooling has taken place.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claim 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over McElroy (U.S. Pat. 4,795,683).

McElroy teaches the following as found in column 2 line 45 et seq.:

> **liquid water mist 3 by aspirator means 4. The liquid water mist 3 is introduced onto the anode 6 and directed to the ion exchange membrane 12 by the desiccant 8 (in powdered form) which has been applied to the catalyst 10. All of the water in the cathode 14, including the liquid water mist 3 which has been transported through the ion exchange membrane 12 and the product water formed at the cathode 14, is available to be evaporated and is shown in the drawing as excess liquid water 15 and evaporated water 17. Electrically conductive wet**

Thus, McElroy is deemed to specifically teach passing water through the proton-conducting membrane [12] from the anode compartment [6] to the cathode compartment [14]. As discussed in the foregoing, the water is evaporated. The evaporation of water is specifically disclosed to cool the cell. (col. 2 line 61-65).

While McElroy does not explicitly teach a liquid coolant/fuel mixture, since both hydrogen gas and liquid water are introduced into the anode compartment, the skilled artisan would find obvious that both components would form a mixture, e.g. humidified hydrogen gas. (see col. 1 line 23, col. 2 line 43) As to cooling of the mixture, the skilled artisan would find obvious that the resulting mixture would be cooled by the evaporation of water at the cathode side, since the entire cell inclusive of all its components and compartments is disclosed to be cooled by such evaporation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julian A. Mercado whose telephone number is (703) 305-0511. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan, can be reached on (703) 308-2383. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-3599 for regular communications and (703) 305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

jam
May 28, 2002

STEPHEN KALAFUT
PRIMARY EXAMINER
GROUP 1700